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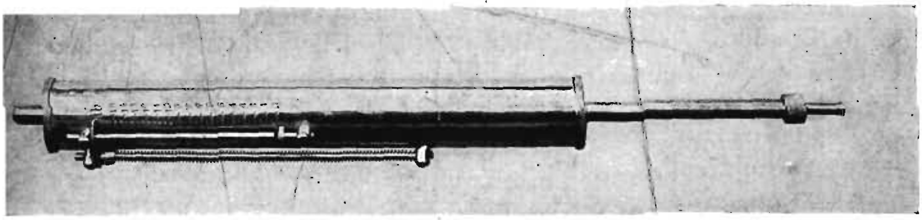

The Peach Tester

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How the Peach Tester is Used

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New Jersey Agricultural Experiment Station
New Brunswick, New Jersey

A Device for Determining the Texture of Peach Fruits for Shipping and Marketing

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The stage of maturity at which any fruit is removed from the tree largely determines its flavor and edible quality, and its shipping, distribution, and storage possibilities. It is particularly important with the peach, which is a delicate fruit when fully ripe. Most varieties attain their highest edible quality only when allowed to become soft-ripe on the tree. The flesh has then become melting, with the exception of the so-called canning type, and it is obvious that soft-ripe peaches cannot be shipped any distance. In fact, even for most local trade they should not be quite soft-ripe.

The more unripe and immature the fruit is, the poorer the flavor and the more green and dull red its appearance. The fruit should therefore be allowed to become as ripe as possible and yet ship and keep sufficiently well to be successfully marketed at the desired point or distance. Fruit picked too mature or soft for a certain market is likely to become badly bruised and discolored and inclined to rot seriously. Fruit picked too green will be hard, unattractive, and unfit for consumption until it softens, and may even shrivel before it ripens.

Ripening Process May Be Rapid

The peach is largely harvested during the season of high temperatures, and maximums above 90 degrees Fahrenheit are not uncommon at times. The fruit matures and softens very rapidly under such conditions. A period of 24 hours frequently determines the difference between a firm-ripe and a soft-ripe fruit, between a degree of maturity that will permit long distance shipment and a relatively much shorter one. There is also a marked difference in varieties as to firmness of flesh at a similar stage of maturity and in the rate at which the fruit softens near the ripe stage.

How Maturity Is Determined

Inexperienced persons and peach pickers sometimes try to determine the maturity or ripeness of a peach by squeezing or pressing with the thumb or fingers. This bad practice is severely

condemned by the best commercial growers, for it results in more or less bruising, particularly of fruit picked fairly ripe for nearby market.

The present approved method of judging the degree of maturity of peaches is by the shade of the under color. When a peach begins to ripen, the green under color gradually assumes a more whitish or cream colored green in the case of a white-fleshed variety, the green tending to disappear and the white or cream white finally to dominate. In a yellow-fleshed variety the green gradually changes to a yellow-green then to yellow or orange-yellow according to the variety. In the case of some varieties the change in color of the fruit is rather closely correlated with the change in maturity or texture. In such cases a keen and experienced observer may be able to judge the degree of maturity quite accurately.

Uncertainties of the Color Method

There are many factors, however, which make the determination of maturity by color most uncertain. There is a marked difference in the texture of the flesh of varieties even when the shade of under color is the same. For example, J. H. Hale may still be quite firm when all traces of green have practically disappeared, whereas Early Crawford or Slappey peaches are usually soft at such a stage. In other words, it becomes necessary to know what a certain shade of color indicates with reference to the maturity of each variety. This is even further complicated by the fact that the correlation of under color and texture varies somewhat according to the growth status of the tree and the growing environment. It is obvious that this greatly complicates the harvesting problem for the average person.

It is further true that there may be considerable variation in the same locality, according to whether the season is dry or wet.

Another uncertainty in the color method is the variation in the ability of different persons to distinguish between various shades of yellow and green. One of the most difficult phases of peach harvesting is to instruct pickers so that the fruit will be uniform in texture and maturity.

Because of the lack of a suitable texture-testing device it heretofore has not been possible to measure accurately the errors of the color method of judging maturity.

Texture Testing Device

It becomes obvious, therefore, that a simple device for accurately determining the texture or relative maturity of the fruit should be of great assistance in peach harvesting and marketing. It should also remove much of the uncertainty of the work of fruit inspectors who report upon the condition of the fruit at point of origin and destination of shipments.

Investigations were undertaken at New Brunswick in 1928 with the object of obtaining data and information that would result in the development of a satisfactory device for testing the texture of peaches under commercial conditions.

Size of the Plunger

An important point to be solved in the development of such a testing device was the size plunger that might be best suited for the purpose. Plungers for testing flesh texture may range from a fine wire or needle type to rounded devices five-sixteenth to one-half inch in diameter. A large number of comparative tests were made through the skin of the fruits using a wire plunger of .032-inch diameter and rounded plungers of three-sixteenth- and five-sixteenth-inch diameters, respectively. In the case of some varieties of peaches all three sizes of plungers were in general agreement. Others, such as Rochester, however, showed a comparatively low test with the needle plunger and relatively high tests with the three-sixteenth- and five-sixteenth-inch plungers. Apparently the nature and toughness of the skin may be a more serious disturbing factor when a needle type of plunger is used for tests made in this manner. Samples of the J. H. Hale peach in a hard ripe condition resisted pressures through the skin with a five-sixteenth-inch plunger up to from 18 to 23 pounds. A plunger requiring less power to operate was desirable if accuracy could be obtained.

Tests made through the skin of fruits of the peach in varying degrees of maturity from shipping to soft ripe appeared to indicate that a three-sixteenth-inch plunger was large enough for accuracy.

The question may be raised whether the skin should not be removed and the texture of the flesh be the basis for judging maturity. Such a procedure would probably be the best for studying the texture of peach fruits for canning and preserving and possibly for studying the influence of various factors upon texture of fruits. Where the texture of the flesh only is desired a plunger larger than a three-sixteenth will be required.

The fresh fruit of the peach is shipped with the skin on and the latter is undoubtedly a factor in shipping quality. The removal of the skin further adds to the time required to make a test. The observations at New Brunswick in 1928 indicated that the degree of maturity of peaches for shipping and marketing could be efficiently measured by tests made through the skin of the fruit.

General Description of the Testing Device

The peach testing device shown on the cover of this bulletin was made up as a result of investigations at New Brunswick during the summer of 1928 and may be described at follows: It consists of a heavily nickel-plated brass tube 10 inches long and seven-eighth-inch outside diameter. This contains a plunger rod of one-fourth-inch diameter made of nickel silver at the bottom and threaded to hold the three-sixteenth-inch plunger. The basic principle of the tester is really a high quality spring, against which the plunger operates within the tube. The plunger is made of monel metal, machined to an accurate size and slightly rounded at the tip to prevent a cutting effect upon the skin and flesh of the fruit.

The pressure scale is stamped upon the metal tube and covers a range of 1 to 15 pounds. The pressure is definitely indicated by a pointer or indicator which moves upward from 0 pounds upon a small metal rod adjoining the scale. This indicator remains in position following a test until restored to the zero position by a special release operated by the user. This is an important feature of the device as it removes all possible guesswork as to the pressure attained.

Desirable Shipping Texture

When peaches are picked, graded, packed, and shipped to market and distributed they are exposed to a certain series of pressures and bumps in the normal processes of handling. It is obvious that a certain texture resistance is necessary or bruising and crushing will result. This necessary degree of resistance will vary according to the methods employed in harvesting, packing, and shipping and the transportation to market.

The peach softens rapidly under high temperatures. It might be picked at a stage at which the flesh texture would be firm enough successfully to resist the normal handling but if allowed to remain at a high temperature for a longer period than usual in the orchard, at the packing house, or in transit, bruising and crushing would occur.

It is quite possible, however, for anyone to determine the degree of texture or pressure resistance necessary for the normal operations of harvesting, packing, and transportation from any given point to a given market. It is further possible for A to determine by means of a texture testing device whether he can pick his fruit a bit more mature than B because of better methods of handling.

The following table of pressures is, therefore, prepared merely as a guide. It was not possible during the summer of 1928 to perfect a device and make a large number of shipping tests at the same time. Nevertheless it is believed that the figures form a fairly reliable guide for eastern growers in determining their particular requirements:

3½ to 5 pounds.	Home or nearby stand
5 to 6 pounds.	Nearby markets
6 to 7 pounds.	Short distance shipping
7 to 8 pounds.	Medium distance shipping
8 to 9 pounds.	Long distance shipping

Fruit which tests 3 pounds or less will not resist the ordinary commercial handling without some bruising. Fruit which tests 3½ to 5 pounds, if picked and handled carefully can be taken to a nearby stand or local store and sold successfully for immediate consumption. If the fruit has to be transported 15 to 25 miles and if it may have to be held 24 hours before being delivered to the consumer it should probably test a minimum of 5 to 6 pounds.

Fruit transported by truck or rail a distance of 50 to 100 miles to be sold the next day should show a test of about 6 to 7 pounds. For shipments to greater distances the fruit should be still more firm as indicated.

Texture of Fruit and Edible Quality

If we could set a definite texture standard of say 7 to 8 pounds for shipments of peaches from one certain point to another and ignore the relation of this pressure standard to the degree of maturity and edible quality of each variety, the matter would be a simple one. But this cannot be done with our present commercial variety list.

Some varieties do not attain an attractive color or a high edible quality until the texture of the flesh has become so soft that it will not ship without bruising. These are now commonly termed "home orchard varieties." The under color of some other varieties, like J. H. Hale, changes to an attractive yellow

or yellow-orange and the quality is good while the flesh is still firm enough to withstand shipment. In other words at a pressure of 7 to 8 pounds the fruit of one variety may be sufficiently advanced in maturity to be attractive to consumers, whereas another, like Mayflower or Greensboro, will be green, immature, and poor in quality. The latter type should, therefore, never be grown for shipment to markets at such distances that the fruit must be picked green.

The development of texture testing devices should bring about the establishment of more accurate standards for harvesting and marketing certain varieties. In other words, Greensboro when picked at a texture exceeding a certain number of pounds will be declared too green and immature for consumption.

Varieties for Shipping Must Qualify

Developments in this direction may result in a demand among growers that a variety possess a certain minimum texture resistance at maturity to be recognized as a commercial variety.

An accurate method of measuring flesh texture in relation to edible quality offers opportunities for a marked advance in removing some of the uncertainties of peach harvesting and marketing.

How to Determine the Texture of Fruit

The individual fruits upon a peach tree do not all mature at the same time. If the variety is Elberta and the growth is not too vegetative, all the fruits may reach about the same degree of ripeness within a period of two to five days. On the other hand, where the trees are decidedly vegetative and the temperature is only medium warm to cool, the variation in ripening between the individual fruits may be as much as 10 days.

One can readily judge the degree of variation in the maturity of the fruit upon a tree by its growth status and by the color of the fruit. The greater percentage of the crop will tend to mature at one time with certain numbers of fruits earlier and later than the bulk of the crop.

One can usually determine the most mature or the more nearly ripe fruits upon a tree by their color. By testing the texture of a few typical specimens representing each degree of maturity one may readily determine the facts for the entire tree. Suppose a few of the ripest specimens show a test of 6 to 7 pounds, a large number a test of 7 to 8 pounds, and a few a test

of 9 to 10 pounds. This would indicate that a few are ready for nearby shipping and the bulk for medium distance shipping. In hot weather a variety like Belle might soften at the rate of at least one pound a day. This suggests how one may note the rate of ripening.

There is likely to be some variation in the texture of different portions of the same fruit. Varieties of the Crawford type, such as Early Crawford, Foster, Fitzgerald, and Niagara, are likely to become soft first at the suture and the apex.

Observations at New Brunswick during 1928 revealed the fact that peaches often showed the least resistance to puncture tests at a point near the stem and directly opposite the suture line. This area extended one-fourth to one-third of the way down the fruit in some cases. Some varieties, such as J. H. Hale and Eclipse, have a rather uniform texture throughout. To determine the texture of any one specimen it is best to make tests at different points, including the cheeks, the suture, and the side directly opposite. For distance shipping, at least, picking should largely be based upon the resistance offered by the ripest portion of the fruit.

Practical Use of the Tester

In just what ways is a texture tester likely to prove of practical value to a peach grower?

It enables the grower himself, an orchard foreman, or a designated person to determine the texture and degree of maturity of the fruit of any variety and to note the rate of the ripening process from day to day. Even one inexperienced in peach growing, with a little instruction, can make tests of maturity and report in definite terms to an orchard owner.

By the use of a texture testing device inspectors can report the maturity of a car of peaches at point of origin and destination of shipment in accurate figures readily understood by anyone. It provides a standard by which an immature or an overripe condition may be measured.

It provides a means by which a grower may study the degree of maturity necessary for him to market a variety successfully under varying conditions of weather and methods of packing, handling and distribution.

It greatly facilitates the instruction of labor engaged to direct the picking of the fruit.

In a limited number of tests with apples, the device appeared to be equally satisfactory for determining the texture of this fruit, but more tests must be made to ascertain the facts.